1851MNRAS..11..133R

The north edge was brightest; it passed midway between β and γ *Arietis* (when at rest) and extended to τ *Arietis.* Its southern edge cut the star μ *Ceti.*

The phenomenon of pulsations of greater and less brilliancy was very apparent and was thought to be in periods of 30^s; when at its minimum brightness, the outline was scarcely distinguishable.

At three different periods during the observations the light widened in extent; and this widening took place each time when the light was at its maximum brightness. This was first noticed at $7^h\ 55^m$, when the north edge extended to β *Arietis.* Again, at $7^h\ 59^m$, when the north edge extended midway between β and α *Arietis*, and thirdly, at $8^h\ 3^m$, when it covered α *Arietis;* it remained in this widened state from 1^s to 3^s, returning each time to its mean place between β and γ *Arietis.* Once, when very dim, the north edge was thought to have receded to γ *Arietis* (viz. at $7^h\ 50^m$). The southern edge was not so narrowly watched, owing to a want of guide stars, so that I cannot speak positively as to whether it receded when the north edge advanced, yet the impression made at the time was, that it did not; and once (at $7^h\ 59^m$) was thought to have widened with the northern edge.

March $22^d\ 8^h$.

Pale and confused; pulsations of brightness.

The weather, especially in February and March, has been very much clouded in the evening, which was unfortunate.

Modifications of the Formulæ for computing the Latitude from extra-meridian Altitudes of the Pole Star. By Mr. John Riddle, F.R.A.S., of the Royal Nautical School, Greenwich Hospital.

"In the preface to the *Nautical Almanac*, p. xi., the following formula is given for finding the latitude from an extra-meridian altitude of *Polaris.*

$$l = a - p \cos h + \tfrac{1}{2} \sin 1'' \ (p \,.\, \sin h)^2 \tan a$$
$$- \tfrac{1}{3} \sin^2 1'' \ (p \,.\, \cos h)\ (p \,.\, \sin h)^2$$

where l = latitude
a = true altitude of star
p = apparent polar distance of star in seconds of arc
h = hour-angle of star = sid. time — R.A. of star.

"I call these corrections c_1, c_2, c_3, and I express the two smaller corrections c_2 and c_3, in *minutes* of arc, and keep p also in minutes in the formulæ for c_2 and c_3.

"Since $c_1 = p \cos h$; $(p \sin h)^2 = p^2 - c_1^2 = (p + c_1)\ (p - c_1)$; substituting this in the second equation, and reducing to seconds.

$$c_2, \text{ in seconds } = 30 \sin 1' \ (p + c_1)\ (p - c_1) \tan a.$$

"In this expression p and c_1 are still expressed in minutes, and

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1851MNRAS..11..133R

as 30 sin 1′ hardly differs from $\frac{1}{100} - \frac{1}{8}$ 100, this quantity is easily allowed for by dividing $(p + c_1)(p - c_1)$ by 100 and deducting one-eighth of the quotient, calling the quantity thus found, q.

$$c_2 \text{ in seconds} = q \tan a.$$

" Three figures in the logs, exclusive of the characteristic, are sufficient.

" Lastly, if, as a matter of curiosity, the value of c_3 is desired,

$$\begin{aligned} c_3, \text{ in seconds} &= 20 \sin 1' (p \sin h)^2 \sin 1' (p \cos h) \\ &= \tfrac{2}{3} q\, c_1 \sin 1' \end{aligned}$$

Or as sin 1′ is nearly ·0003, we may say,

$$c_3 = {\cdot}0002\, q\, c_1,$$

In which q and c_1 may be taken roughly.

Example.

" On August 18th, 1851, in longitude 56° east, at $8^h\ 56^m\ 14^s$ mean time at the place, the altitude of the pole star, corrected for dip and refraction, was found to be 56° 28′ 33″; required the latitude: We have for the computation of the corrections,

$$\begin{aligned} h &= 264^\circ\ 1' \\ a &= 56\ 28 \\ p &= 5355'' = 89'{\cdot}3 \end{aligned}$$

c_1	c_2	c_3
log p = 3·7288*	p = 89·3	q = 70
log cos h = −9·0183	c_1 = 9·3	c_1 = 9
Sum = −2·7471 = log 558″·6	Sum = 98·6	$q\,c_1$ = 630
c_1 = −9′ 18″·6	Diff. = 80·0	Const. = ·0002
	Prod. × ·01 = 78·88	Prod. = 0·13 = c_3
	$-\frac{1}{8}$ = 9·86	
	q = 69·02 log = 1·839	
	tan a = 0·179	
	2·018 = log 104″·2 = c_2	

$$\begin{array}{rl} \text{Alt.} = & 56^\circ\ 28'\ 33'' \\ -c_1 = & +\ \ 9\ 18{\cdot}6 \\ \hline & 56\ 37\ 51{\cdot}6 \\ +c_2 = & +\ \ 1\ 44{\cdot}2 \\ \hline & 56\ 39\ 35{\cdot}8 \\ -c_3 = & +\ \ {\cdot}1 \\ \hline \text{Latitude} = & 56\ 39\ 35{\cdot}9 \text{ N.} \\ = & 56\ 39\ 35{\cdot}5 \text{ by spherics.} \end{array}$$

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* Logarithms of 5 places must be used if the result is required to decimals of a second.

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